

## Section 8-1: Parallel and Perpendicular Lines

**By the end of this lesson, you should be able to answer:**

- How do you determine if two lines are parallel or perpendicular?
- How do you write equations of parallel and perpendicular lines?

**Where you might see this in the real world:**

- Sports, travel, safety

Define the following term:

1. Negative reciprocals

Begin by opening your book to page 334 and complete the graphing activity at the top of the page. Work with a partner.

You should have noticed that for the first three problems, we had lines that did not intercept, which are parallel lines. What was the slope of these lines?

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From this information, we can conclude that all parallel lines have \_\_\_\_\_. Conversely, we can also say that lines that have \_\_\_\_\_ are parallel.

For the last three problems, the new line you graphed intersected all of the parallel lines in the same way. This line was perpendicular to the original lines.

Now compare the slopes of the original lines and the new perpendicular lines. The slopes are \_\_\_\_\_. When we multiply the two slopes together, they will always equal \_\_\_\_\_. Thus, we can conclude that if two lines are perpendicular, then the product of their slopes is \_\_\_\_\_, and if the product of the slopes of two lines is \_\_\_\_\_, then the lines are perpendicular.

Example 1: Suppose you have a line that has a slope of 4. What would be the slope of:

a. the perpendicular line?

b. the parallel line?

Example 2: Write the equation for the line that passes through  $(-1, 3)$  and is parallel to the line  $3y - 6x = 12$ .

In example 2, we had to first figure out the slope of our original line by rewriting the equation into slope-intercept form. Then, we had to realize that a parallel line would have the same slope. At that point, we knew that we had a point and a slope, so we needed to use the point-slope form to find the equation of the line. For reference, write the formulas for the slope-intercept form and point-slope form below:

Slope-intercept:

Point-slope:

Example 3: Write the equation for the line that passes through  $(2, 7)$  and is perpendicular to  $y = -\frac{3}{4}x + 6$ .

Quick Questions: 1) What is true about the slopes of all horizontal lines? Vertical lines?

2) If you knew the coordinates of four vertices of a quadrilateral, how could you use slope to determine if the figure is a parallelogram?

Homework:

"It is perhaps a more fortunate destiny to have a taste for collecting shells than to be born a millionaire." - Robert Louis Stevenson